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Group 2700

Dayton, Ohio

Docket No. 7890

Application of

Michael G. Coutts et al.

Serial No. 09/229,046

Filed: January 12, 1999

**CLAIM FOR BENEFIT OF
EARLIER-FILED FOREIGN
APPLICATION**

APR 28 1999

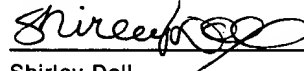
Group Art Unit: 2731

Examiner: Unknown

FOR: TRANSACTION PROCESSING SYSTEMS MAINTENANCE

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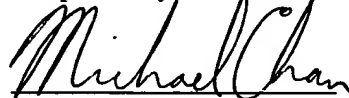
Assistant Commissioner for Patents

Washington, D.C. 20231

Sir:

Applicants wish to claim the benefit of the filing dates of the earlier U.K. Application Serial Nos. 9816178.9, filed on July 25, 1998; 9808995.6, filed on April 29, 1998; and 9808997.2, filed on April 29, 1998, recited in the Declaration under the provision of 35 U.S.C. 119, and accordingly, Applicants submit herewith a certified copy of each of said British applications.

Respectfully submitted,



Michael Chan

Reg. No. 33,663

Attorney for Applicant(s)

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Cardiff Road
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1. Your reference

25 JUL 1998 890

2. Patent application number

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9816178.9

25 JUL 1998

3. Full name, address and postcode of the or of each applicant (underline all surnames)

NCR INTERNATIONAL, INC.
1700 SOUTH PATTERSON BOULEVARD
DAYTON, OHIO 45479
UNITED STATES OF AMERICA

Patents ADP number (if you know it)

105449001

If the applicant is a corporate body, give the country/state of its incorporation

INCORPORATED IN THE STATE OF DELAWARE
UNITED STATES OF AMERICA

A/L dated 19.9

4. Title of the invention

METHOD AND SYSTEM FOR ROUTING AGENT
PROGRAMS CARRYING OPERATING DATA THROUGH
A COMMUNICATIONS NETWORK

AW
10.9.98

5. Name of your agent (if you have one)

VIVIEN IRISH

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

INTERNATIONAL IP DEPARTMENT
NCR LIMITED
206 MARYLEBONE ROAD
LONDON NW1 6LY

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7156844001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
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Date of filing
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
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Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination (*Patents Form 10/77*)

Any other documents
(please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature *Vivien Irish* Date 24/7/98

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1
DUPLICATE

Method and system for routing agent programs carrying operating data through a communications network.

5 The present invention relates to a method and system for routing agent programs through a communications network which includes a site including a service terminal. The service terminal may be a self service terminal such as a cash dispensing terminal, a self service checkout terminal or a retail point-of-sale (PoS) terminal.

10 Such terminals are required to operate under extreme service conditions. Twenty-four hour availability is extremely important to through-the-wall automated teller machines (ATM's) which continue to operate after normal
15 banking hours. This is compounded by the move towards off-site ATM's which are located in retail locations and petrol stations, where access by the on-site staff may be restricted for security reasons. Within the retail environment, PoS terminals must operate reliably in many
20 diverse locations from large supermarkets to small retail locations.

These systems can fail to operate due to two basic types of error. Firstly, hardware and system failures, and
25 secondly failure caused by consumable media. The mechanical transports within ATM's that allow media (currency, tickets, receipts, cards) to be moved around may fail due to jamming by bad media. Cards can jam in the card reader, currency can jam in the dispenser
30 transport, while receipt paper can jam within the printer mechanism or its external transport. These critical errors will immediately take the terminal out of service and require immediate actions to be taken to recover the situation.

35 Point-of-sale (PoS) terminals can have similar hardware failures such as receipt paper jams, cash drawer release failure or the failure of support systems such as scanners or weighing scales. While the traditional PoS

terminal may well be run by an operator, the operator may not be trained or authorised to perform repair operations and may need to call for assistance when a failure occurs. New forms of self-service checkout terminals (SST's) being developed integrate some of the functions of an ATM with a PoS terminal. This type of unattended system can suffer the same critical failures as a PoS terminal or an ATM.

10 The consumable media within an ATM, a PoS or an SST terminal include currency leaving an ATM and entering a PoS terminal, receipt paper, tickets and cards. There are situations where cards are captured by ATM's or currency is purged during a dispensing process. There is a limit to the capacity within the capture and purge bins which requires the bins to be emptied as they approach the capacity limit. Similarly, when an ATM has a depository accepting envelopes or cheques, the corresponding capture bin must be periodically emptied.

20 Within the PoS terminal, where currency is entering in large denomination notes and leaving in smaller denomination notes and change, there are times when the mix of currency in the cash drawer is unsatisfactory to meet the transactions being processed. It may be necessary for the operator to call for assistance to restock the cash drawer with an appropriate mix of currency.

30 Clearly, critical failure resolution and consumable media management are important issues for ATM, SST and PoS terminals. A number of techniques exist which attempt to address these issues. The larger retail stores often utilise a loudspeaker system to allow the operator to call for assistance. This could be in response to some critical situation such as a receipt paper jam where the customer must wait for the problem to be resolved. It could be in response to running low on low denomination currency where the customer may be given an undesirably

large amount of small change. Either situation undesirably inconveniences the customer.

Where the terminals are included in computer systems,
5 application programs may be used to monitor the operation of the terminal devices (e.g. the printer) and the consumable media (e.g. low supply of the printer paper) in order to predict potential failures. On stand alone terminals appropriate messages may be displayed to the
10 user on a user display or to an operator on a specialised operator display. However this still requires that someone regularly checks the terminals to read the displayed messages and it poses a problem for off-site locations in regard to nominating someone to check the
15 terminals.

It is the aim of the present invention to provide an improvement in monitoring a service terminal by incorporating the terminal into a communications network
20 and communicating operating data relating to the operation of the terminal.

According to the present invention, there is provided a communications network comprising a plurality of
25 interconnected network sites, and switching means to route intelligent agent programs through the communications network by reference to site address information carried by each agent program, wherein the network has a terminal network site which includes;
30 a service terminal having at least one service element;
monitoring means to derive operating data relating to an operating parameter of the service element;
an operating data register to receive operating data
35 from the monitoring means;
and data processing means programmed to launch an intelligent agent program carrying the operating data from the terminal network site into the network.

Further according to the present invention, there is provided a method of communicating intelligent agent programs through a communications network comprising a plurality of interconnected network sites and switching means to route intelligent agent programs through the communications network by reference to site address information carried by each agent program, the network having a monitoring network site and a terminal network site including a service terminal having at least one service element, the method comprising the steps of;
monitoring the service element to derive operating data relating to an operating parameter thereof and;
launching from the terminal network site to the monitor network site an intelligent agent program carrying the operating data.

The service terminal may be an ATM, a PoS or an SST.

The invention will now be described, by way of example, with reference to the accompanying drawings in which;

Figure 1 is a schematic block diagram of a bank branch network embodying the present invention,

Figure 2 shows elements included in one of the network terminal sites in the network of Figure 1,

Figure 3 shows elements of an intelligent agent program which is communicated through the network of Figure 1,

Figures 4a to 4c show monitoring intelligent agent programs used in the network of Figure 1,

Figures 5a to 5c show service intelligent agent programs used in the network of Figure 1,

Figures 6a to 6c show alert intelligent agent programs used in the network of Figure 1, and

Figures 7a to 7c show a petrol station network embodying the present invention.

5 In Figure 1, a local area network within a bank branch is in the form of a TCP/IP LAN with a number of network terminal sites including ATM's 10, teller stations 11 and back office terminals 12. The terminal network sites are interconnected through a local bus network 13 to a server
10 14. A connection is made from the server 14 to a wide area network bus 15. The network architecture illustrated is intended to represent a simple bank branch but the concepts to be described are intended to apply equally to more complex network environments with many terminal
15 sites and back office systems. The concepts apply equally well to networks employed in environments, such as retail environments, other than banking. In these other environments the ATM's and teller stations shown in Figure 1 may be replaced by terminal sites such as point-
20 of-sale terminal sites.

In Figure 2, there is shown a number of service terminals 16 each of which constitutes one of the network sites 10, 11 or 12 of Figure 1. The service terminals 16 are
25 illustrative of an ATM, a teller station or a back office terminal. The service terminals 16 may be terminals included in one of the alternative forms of network as already explained with reference to Figure 1. The terminals 16 are labelled terminal A, terminal B and
30 through to terminal n.

The service terminals 16 are connected through an I/O port 17 to the bus 13 of the local area network of Figure 1. The service terminals A through n are capable of
35 communicating with the bus 13 to receive intelligent agent programs A to N from the network and to launch intelligent agent programs into the network. Each service terminal 16 includes an agent handler shown within the dotted line area 20. The intelligent agent programs are

used for a variety of purposes including monitoring the operations of the terminals, updating the network and alerting the network to terminal site problems as will be described.

5

In Figure 3, an intelligent agent program 30 includes packets of digital information divided into fields. The agent programs 30 include a header and source address field 31. The source address indicates the site address of the user site 10 from which the agent program 30 is launched into the communications network. An address field 32 includes sub fields 32a, 32b .. 32n each of which may contain the address of a target site in the network. The agent program is thus able to carry a visit list of sites to be visited by the agent program, the visit list including a minimum of one site address.

A code and data field 33 includes program instructions for the network sites to be visited by the agent program. A register field 34 is a field to register data collected by the agent program.

In Figures 4a to 4c, the network of Figure 1 is shown to include network sites each of which has an intelligent agent handler 20. The server 14 includes a State-of health monitor 21. The monitor 21 periodically launches an intelligent agent program in the form of a monitor agent onto the network bus 13. In Figure 4a, a monitor agent is shown as arriving at ATM 1 after having been launched from the server 14. The monitor agent is shown in full lines at its arrival point and is shown in dotted lines to represent the previous point of departure from the server 14. The monitor 21 provides the monitor agent with a list of addresses in the address field 32 of the agent program allowing it to roam through the network.

Upon reception of an agent program by the I/O port 17 of a service terminal A, a CPU at that site confirms in step 50 (see Figure 2) that the site address targeted by the

agent program matches the site address of the service terminal A. The CPU submits the agent program to a security check in step 51 to ensure that the agent program is authorised to access data in a service register database available at that service terminal site. Upon satisfactory completion of the security check, the CPU updates the service register from a set of terminal monitors 40. The monitors 40 include means to monitor physically the operations being carried out at the terminal site. In the case of an ATM, such monitors include monitors for the mechanical transports within the ATM and the capacity of the purge and capture bins. The monitors are placed and arranged to monitor the terminal so as to provide operating data which indicates the state of health of the terminal. The operating data is captured by the service register in step 52 upon the arrival of each monitor agent through the I/O port 17.

From step 52, the terminal enters step 53 where the monitor program agent is entered into the runtime environment where the service data requested by the program agent is entered into the program register field 34. Following the step 53, the program agent is relaunched into the network in the step 54. Once relaunched into the network, the program agent will visit other terminal sites B ..n as shown diagrammatically in Figure 2. The monitor agent goes to the first location on its address list (ATM 1) where it obtains the information specific to that location. Having removed ATM 1 from its list of locations to visit, the dynamically modified monitor agent moves on to the next location to be visited, ATM 2. The movement of the monitor agent from ATM 1 to ATM 2 is shown diagrammatically in Figure 4b. The process of handling the monitor agent is repeated in the agent handler 20 of ATM 2 and this pattern continues until all the locations have been visited, whereupon the monitor agent returns to the server 14 to impart the information obtained by travelling through the network as shown diagrammatically in Figure 4c.

The State-of health monitor program in the server 14 is thus able to utilise information provided by the returning monitor agents to build up a dynamically changing picture of the terminal sites under its gaze, identifying problem areas and scheduling replenishment and maintenance operations based upon local requirements as opposed to some overriding average as might be conducted by a centralised help desk approach. The search for and selection of the information from one or more of the service registers at the terminal sites is controlled by the program instructions included in the code and data field 33 of each intelligent agent program. This allows the agent programs to roam the network finding out information about the individual sites such as their state of health, usage of consumables and configuration. This information can be collated by the agent software and taken with the agent as it moves from each terminal site to the next. Ultimately a roaming agent of this form will arrive at a location, such as the server location 14, where the information can be utilised in some appropriate manner. This information can be used to alert an operator of some impending problem. Alternatively, the information can be used to schedule an appropriate time to service a terminal site, for example by replenishing consumables, depending upon the information returned to the server 14.

As well as retrieving information from the locations that they visit, intelligent program agents can also impart information as will now be explained with reference to Figures 5a to 5c. In Figure 5a, each of the back offices 12 can support a replenisher or field engineer who can log on or off the network. When logging on, the back office 12 automatically sends out a service agent program identifying that replenisher or field engineer to the ATM's 10 and teller stations 11 on the network as an available service resource. The back office 1 is seen in Figure 5a to have launched a service agent which is being

received by the ATM 1. The service agent is processed by the agent handler of each service terminal before passing on through the network. In Figure 5b, the service agent from back office 1 is seen as having been relaunched by ATM1 and is seen as arriving at ATM 2. Similarly, when logging off, the back office automatically sends out a service agent program identifying to all the ATM's and teller stations that the respective service resource is no longer available.

10

Field engineers from the wider area network may send service agent programs into the local area network through the server 14. In Figure 5c, a service agent program which has arrived via the bus 15 is seen in dotted lines as having been launched by the server 14 onto the local area network and is seen in full lines as arriving at the ATM 1. The service agent programs from the wider area network are subject to security checks before passing into the local area network. The server 14 is programmed to stop service agent programs from the local area network from reaching the wider area network.

Upon reaching a network site, the service agent program compares the service and location information it carries with corresponding information in an agent register (see Figure 2) at the network site. This technique allows updating of the internal location lists of each network site and updating of location information carried by the agent program.

30

When a critical failure occurs within an ATM or teller station in the network, an alert agent program may be launched by the site experiencing the failure. An alert agent program is shown in Figure 6a as having been launched by the ATM 3. The alert agent would indicate a critical failure such as a card jam. The alert agents use the location list built up in the agent register 55 from the service agents which visited earlier. An alert agent is launched to arrive at the agent handler at each

location on its list either in turn or according to some predefined rules. Such rules could specify local sites first and then remote sites. The alert agent from ATM 3 is seen in Figure 6a as having arrived at the agent handler of back office 1.

Upon reaching an agent handler of a replenisher or maintenance program, the alert agent queries the training and authority levels recorded there in order to decide whether help is available. If a person is available who is trained and authorised to work on the error contained within the alert agent, then the alert agent presents a request for assistance on that person's terminal. If assistance is not available because the requested person is away from the terminal, the alert agent is programmed to time out and move on to the next location on its list. If the requested person cannot assist because they are otherwise occupied, for example with a customer, the requested person can close the agent interface and again the alert agent will move to the next location on its list. In Figure 6b, the alert agent from ATM 3 is shown in dotted lines as having left the back office 1 and in full lines as arriving at back office 2.

If the replenisher 2 fails to assist, the alert agent passes to replenisher 3 which might also fail to assist. In this case the alert agent passes through the server 14 to seek assistance from replenishers on the wider area network as shown diagrammatically in Figure 6c. If at any point the alert agent successfully summons assistance, the alert agent is acknowledged and the critical failure information carried by the alert agent is registered at the location capable of assisting. The information includes the error type, such as a card jam, and an identification of the terminal concerned. The identification may simply be a terminal number in the case where assistance is to be provided from within the environment of the local area network. Otherwise, the identification will include an address and contact

information for gaining access to the terminal. Once an alert agent has successfully summoned assistance, it returns to the originating terminal site. Alternatively, the alert agent may delete itself.

5

In Figures 7a to 7c, a petrol station site includes an ATM 70 and a point-of-sale terminal 71. The ATM 70 and terminal 71 are connected in a local area network to a server 72 by means of a bus 73. The server 72 is
10 connected into a wider area network.

The server 72 includes a state-of-health monitor which periodically sends out a monitor agent to both the terminals 70 and 71 as shown in Figure 7a in order to
15 perform status monitoring and to schedule replenishment operations. This is extremely important within an off-site environment where field service or security companies are likely to be used to provide cash replenishment. The state-of-health monitor shown located
20 in the server 72 may alternatively be operated from a central site communicating with a proxy server acting locally.

The terminal 71 can provide a replenisher program to send
25 out a service agent when a new user logs in as shown in Figure 7b. A field service organisation is used to send a service agent through the server 72 to register with both the ATM 70 and the point-of-sale terminal 71. Both terminals 70 and 71 can be supported by the same field
30 organisation.

A critical error occurring in the ATM 70 causes the ATM to launch an alert agent, as shown in Figure 7c, which goes to the local replenisher application in the terminal
35 71. The alert agent performs training and authority checks to ascertain if assistance is obtainable for the error. For simpler errors, the petrol site attendant staff will assist. For more complex errors, the alert agent is sent out from the terminal 71 to the server 72

to be passed out to the wider network. The alert agent is used to alert a field service organisation.

Alternatively, the alert agent may cause other communication strategies to be brought into play such as
5 an E-mail message, paging a local replenisher or traditional transaction based alerting to a help desk, allowing them to call into a bank branch.

CLAIMS

1. A communications network comprising a plurality of
5 interconnected network sites, and switching means to
route intelligent agent programs through the
communications network by reference to site address
information carried by each agent program, wherein the
network has a terminal network site which includes;
10 a service terminal having at least one service
element;
monitoring means to derive operating data relating
to an operating parameter of the service element;
an operating data register to receive operating data
15 from the monitoring means;
and data processing means programmed to launch an
intelligent agent program carrying the operating data
from the terminal network site into the network.
- 20 2. A communications network as claimed in claim 1,
wherein the data processing means is programmed to launch
an intelligent agent program by re-addressing a visiting
agent program to which the operating data has been added.
- 25 3. A communications network as claimed in claim 1,
wherein the data processing means is programmed to launch
an intelligent agent program in the form of an alert
program which has been generated at the said terminal
network site to carry the operating data.
- 30 4. A communications network as claimed in claim 1, 2 or
3, wherein the data processing means is programmed to
collect site address information from visiting agent
programs.
- 35 5. A communications network as claimed in claim 1, 2, 3
or 4, wherein the terminal network site constitutes one
of a plurality of such terminal network sites.

6. A communications network as claimed in claim 5, wherein the terminal network sites comprise a self service cash dispensing terminal site.

5

7. A communications network as claimed in claim 5 or 6, wherein the terminal network sites comprise a retail point of sale terminal site.

10 8. A communications network as claimed in claim 5, 6 or 7, wherein the terminal network sites comprise a self service terminal site.

15 9. A communications network as claimed in any one of the preceding claims, further including a monitor network site which includes;

data processing means to launch agent programs to visit the terminal network site or sites so as to collect operating data therefrom for return to the monitor

20 network site, and

a monitoring data register to register the operating data returned to the monitor network site.

25 10. A terminal network site for connection to a network as claimed in claim 1, the terminal network site comprising;

a service terminal having at least one service element;

30 monitoring means to derive operating data relating to an operating parameter of the service element;

an I/O port for the communication of intelligent program agents into the terminal network site from the network and from the terminal network site into the network;

35 data processing means to receive and process program agents visiting the terminal network site and received through the I/O port and;

an operating data register to receive operating data from the monitoring means;

the data processing means being programmed to launch an intelligent agent program carrying the operating data from the terminal network site into the network.

5 11. A network site as claimed in claim 10, wherein the data processing means is programmed to launch an intelligent agent program by readdressing a visiting agent program to which the operating data has been added.

10 12. A network site as claimed in claim 10 or 8, wherein the data processing means is programmed to launch an intelligent agent program in the form of an alert program which has been generated at the said terminal network site to include the operating data.

15 13. A method of communicating intelligent agent programs through a communications network comprising a plurality of interconnected network sites and switching means to route intelligent agent programs through the
20 communications network by reference to site address information carried by each agent program, the network having a monitoring network site and a terminal network site including a service terminal having at least one service element, the method comprising the steps of;
25 monitoring the service element to derive operating data relating to an operating parameter thereof and;
launching from the terminal network site to the monitor network site an intelligent agent program carrying the operating data.

30 14. A method as claimed in claim 13, wherein the step of launching an intelligent agent program comprises re-addressing a visiting agent program to which the operating data has been added.

35 15. A method as claimed in claim 13, wherein the step of launching an intelligent agent program comprises launching in an alert program which has been generated at

the said terminal network site to carry the operating data.

16. A method as claimed in claim 13, 14 or 15, comprising
5 the further step of collecting site address information
from visiting agent programs.

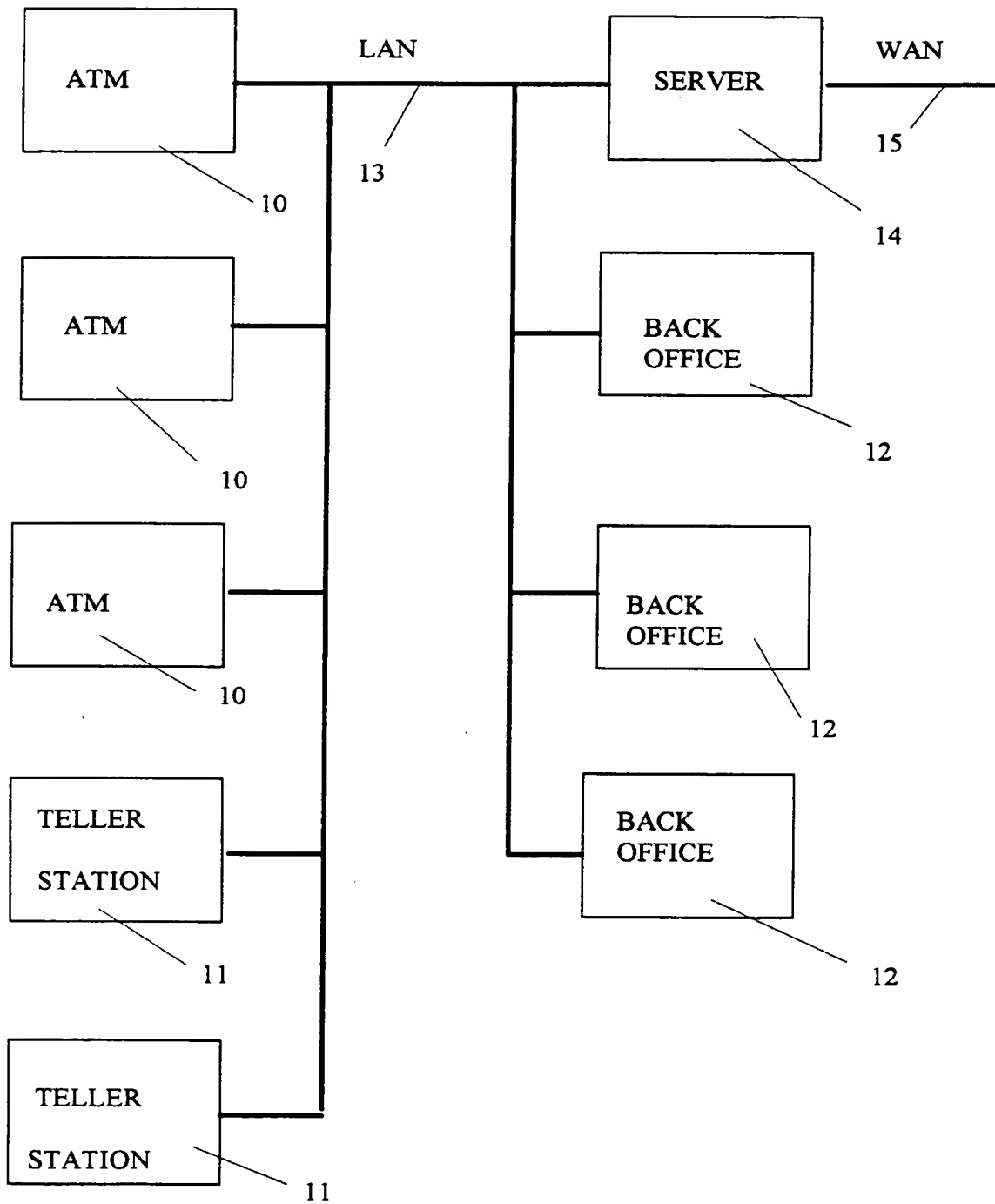
ABSTRACT

The present invention relates to a communications network comprising a plurality of network sites. Agent programs
5 are switched through the communications network by reference to site addresses included in a site visit address list carried by each agent program.

The network has a number of network sites which have
10 service terminals such as ATM's, point-of-sale terminals or self service terminals. Each service terminal has at least one service element such as a card transport or currency bin and monitoring means to derive operating data relating to an operating parameter of the service
15 element. The operating data may be the presence of an error such as a card jam or the need to replenish or empty a currency bin. An operating data register receives operating data from the monitoring means and data processing means is programmed to launch an intelligent
20 agent program carrying the operating data from the terminal network site into the network.

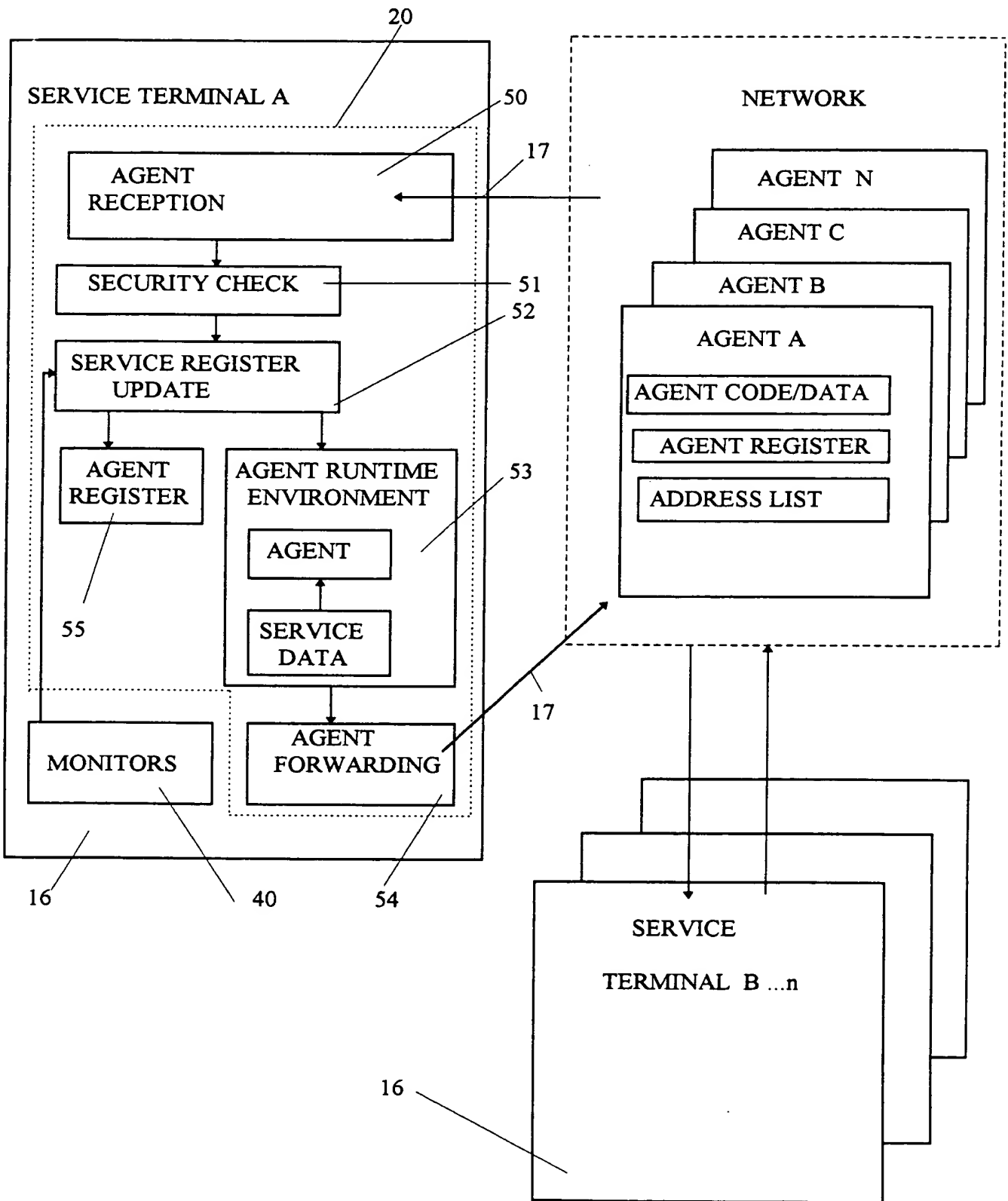
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FIGURE 1



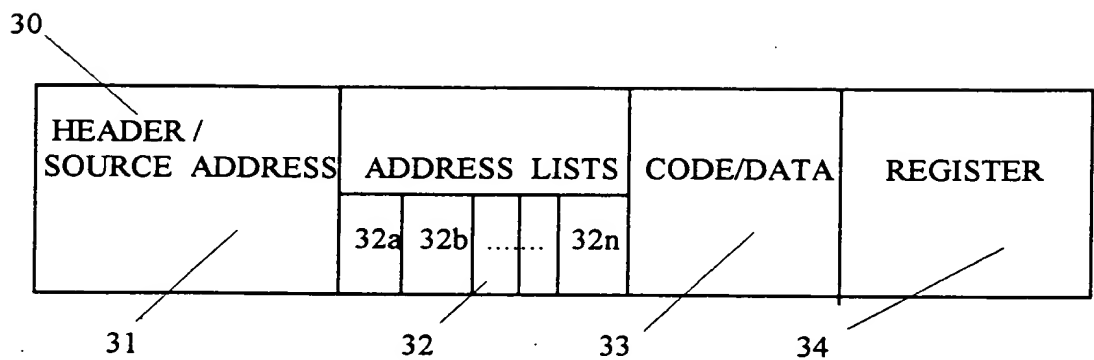
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FIGURE 2



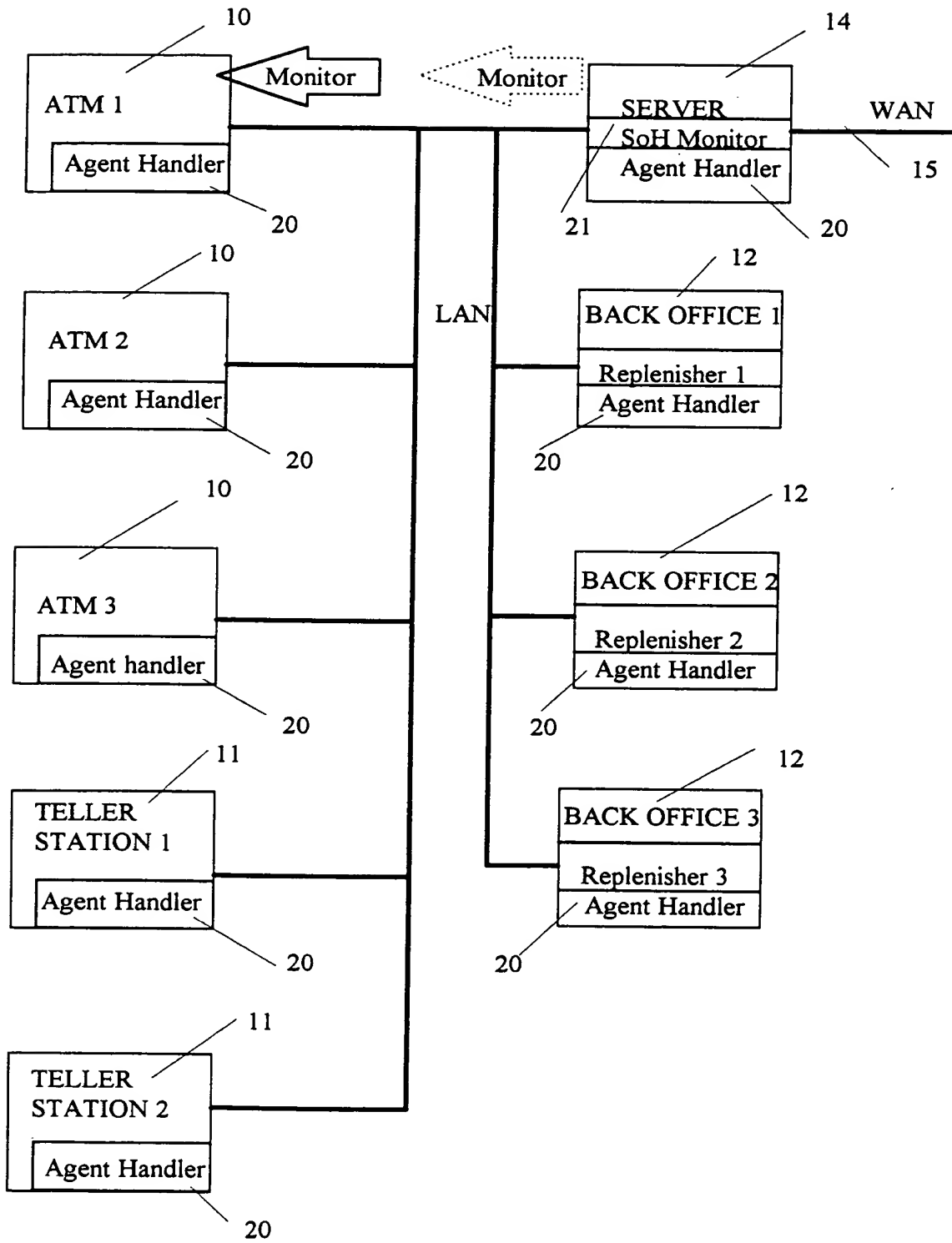
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FIGURE 3



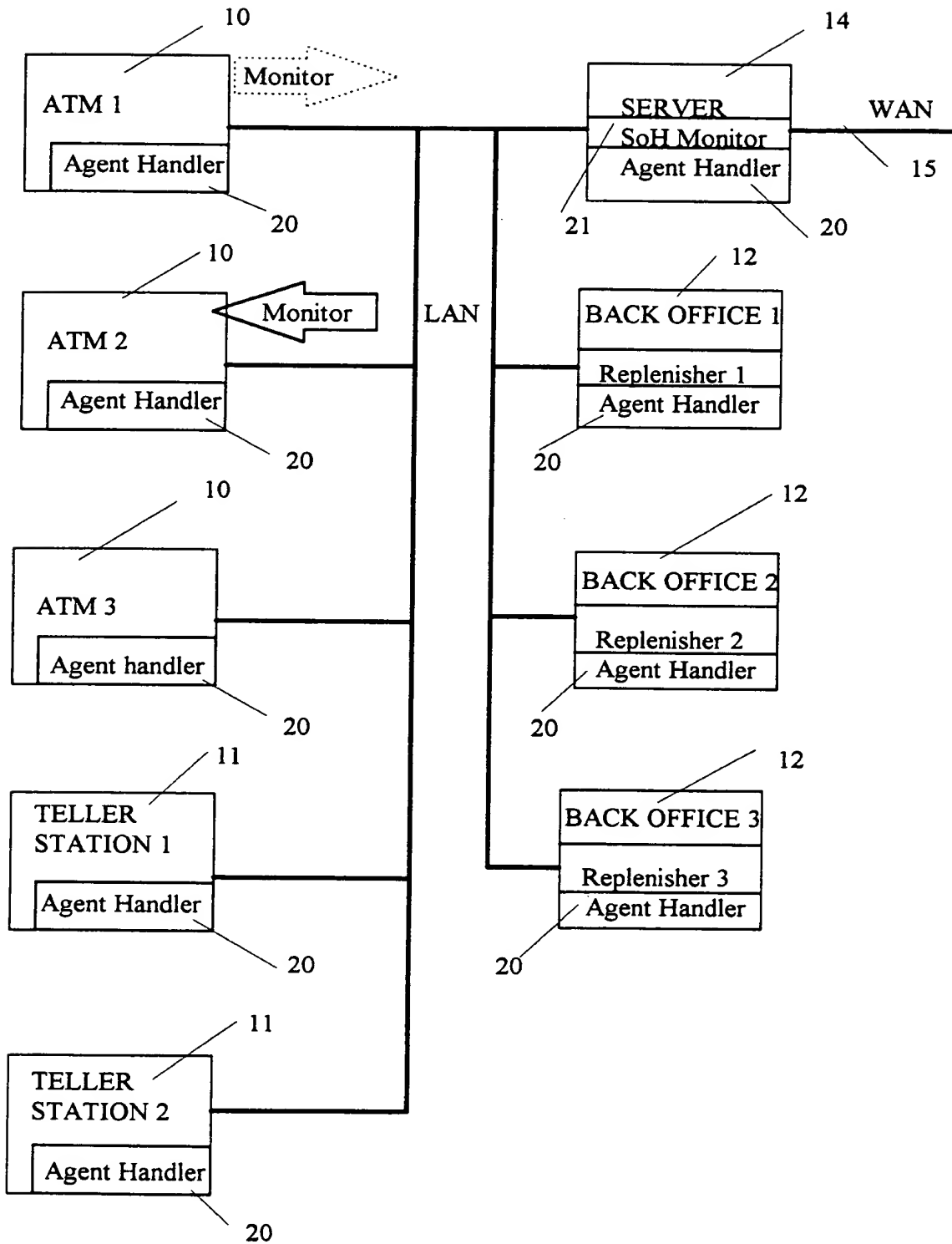
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FIGURE 4a



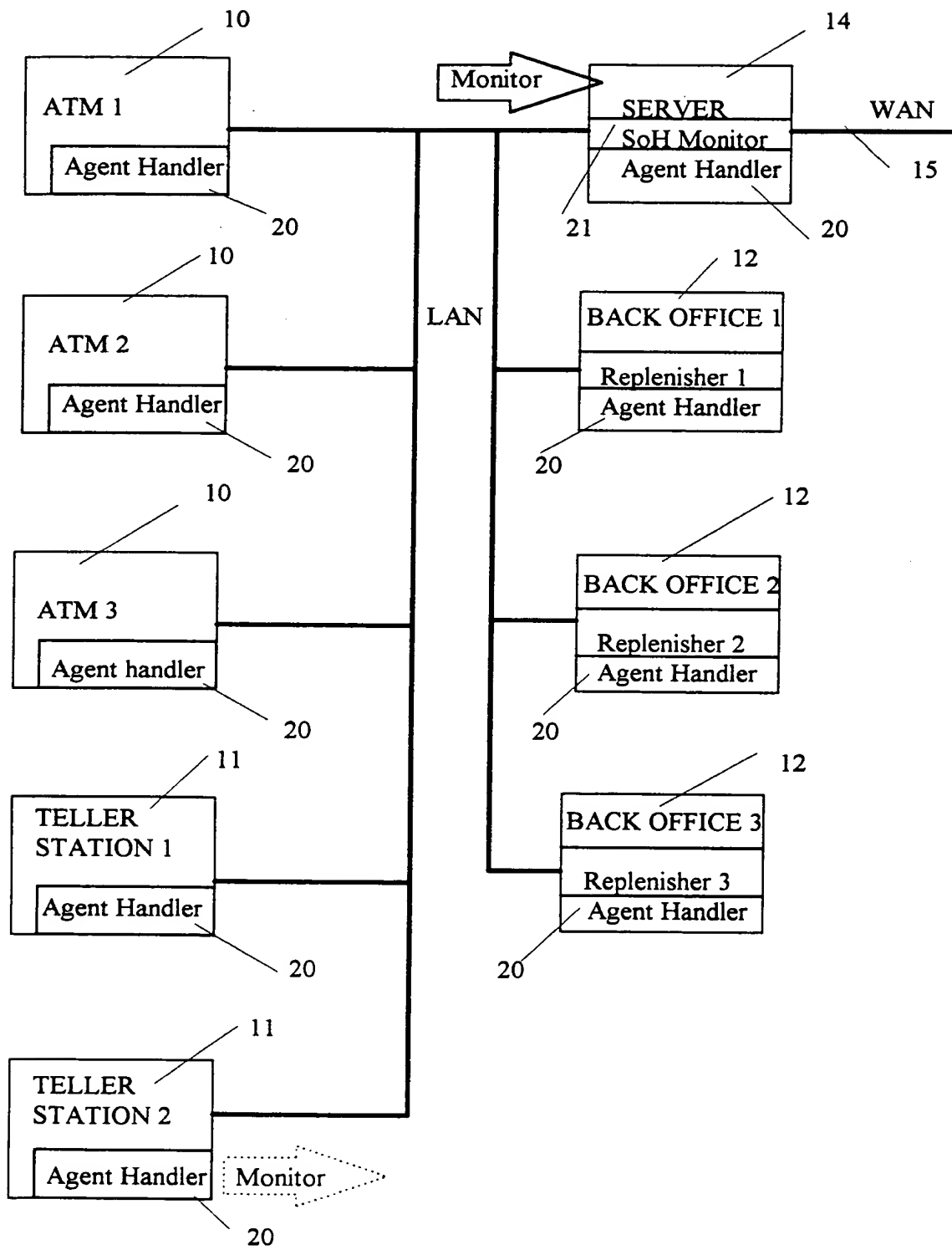
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FIGURE 4b



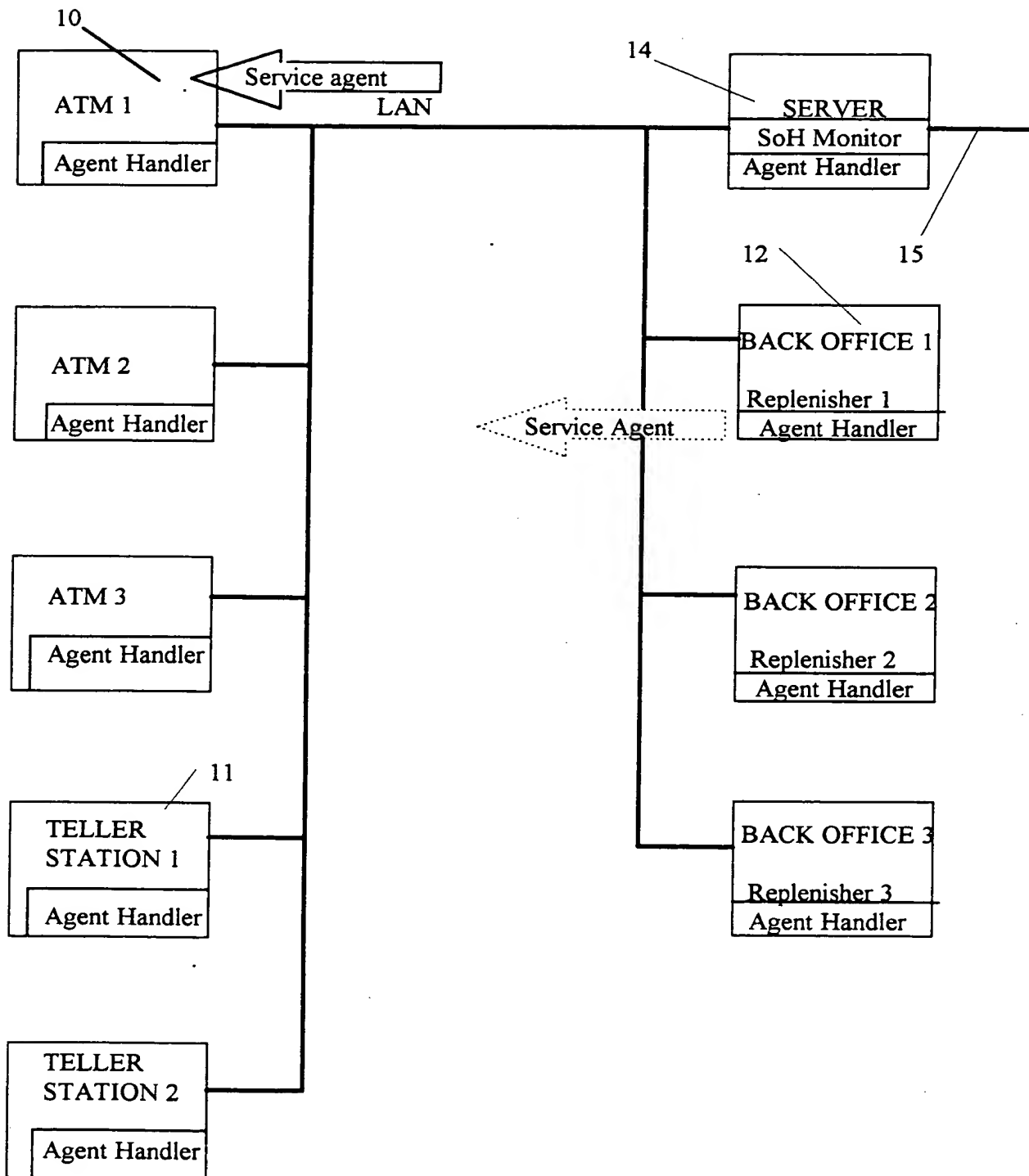
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FIGURE 4c



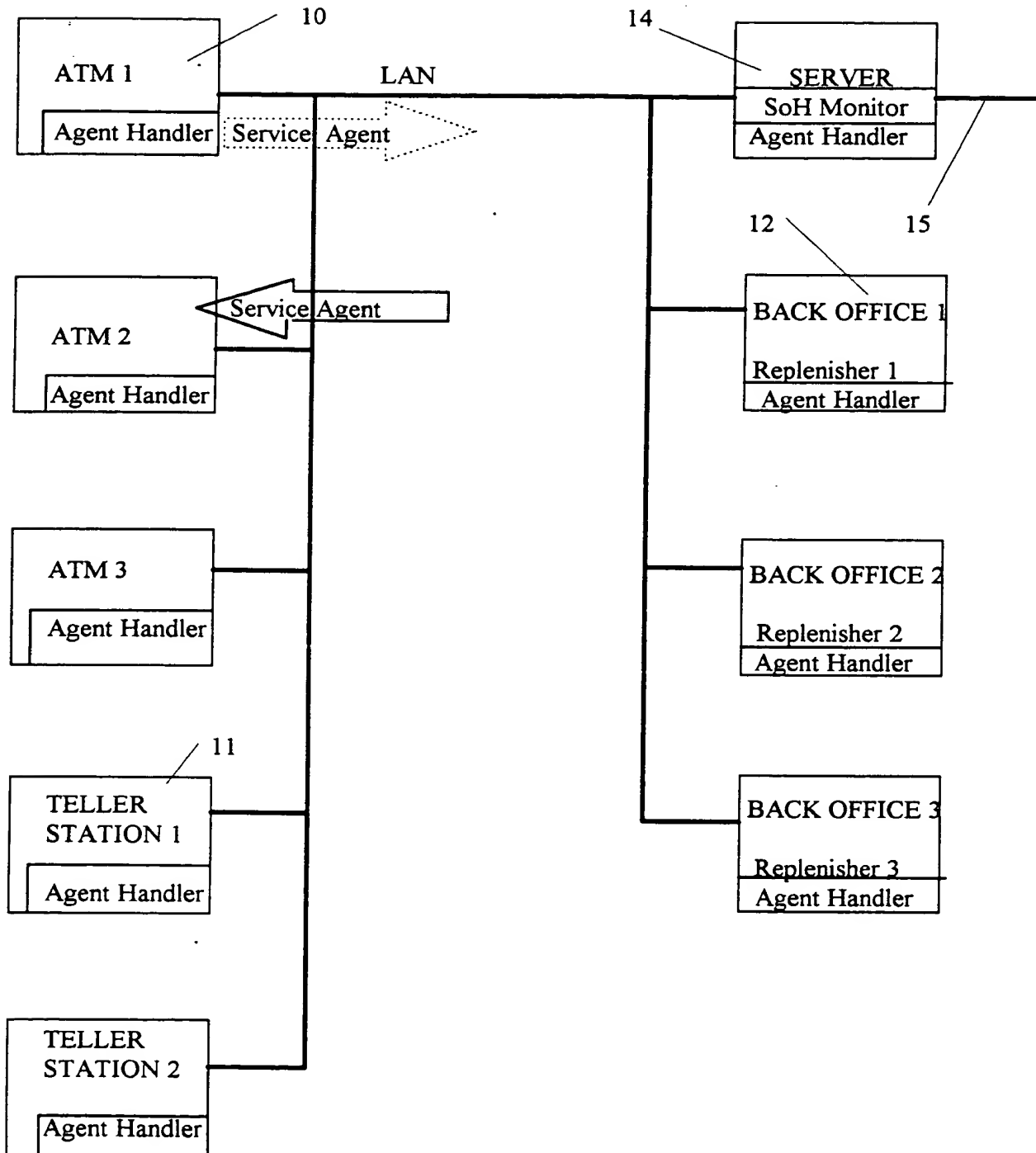
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FIGURE 5a



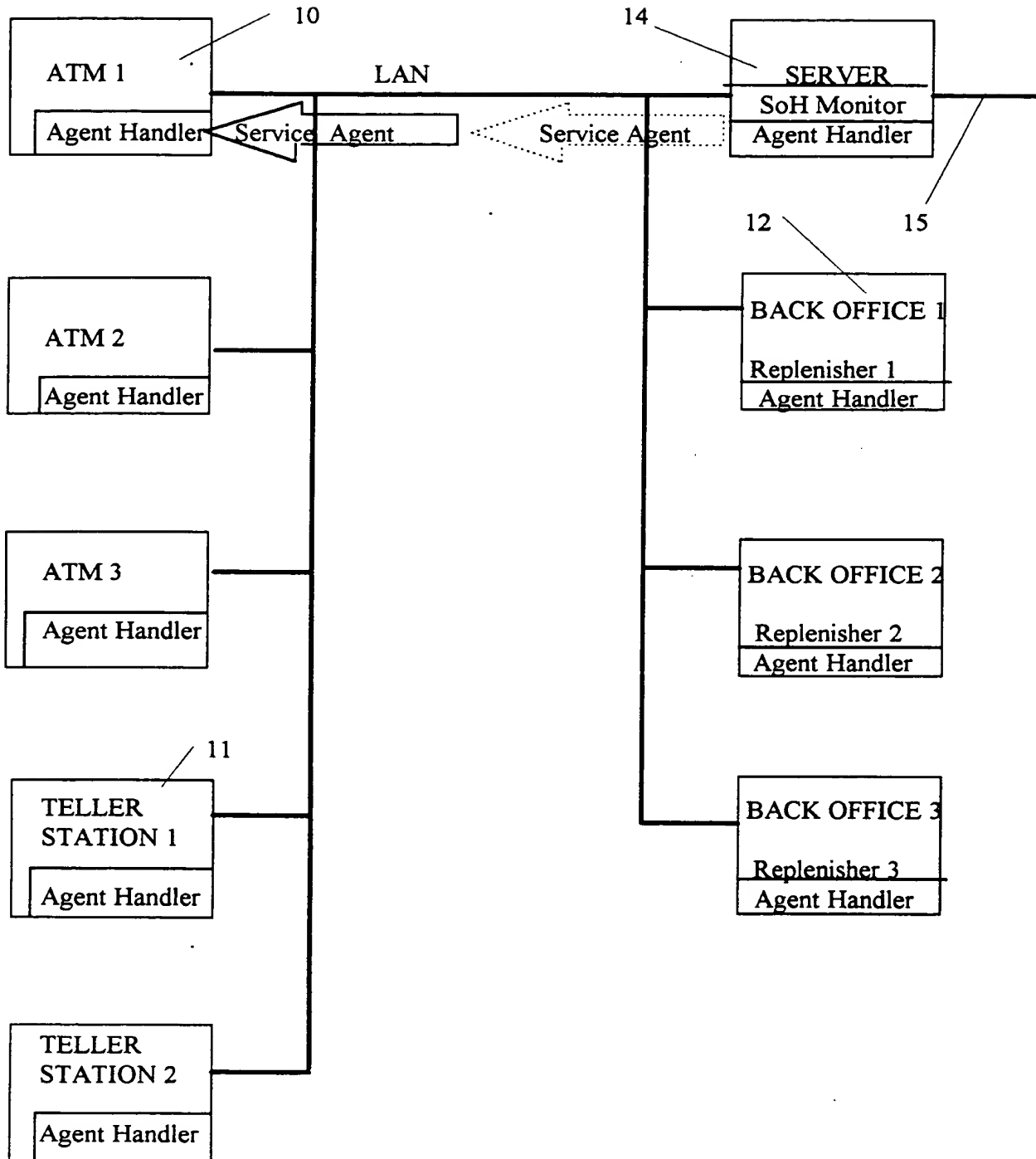
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FIGURE 5b



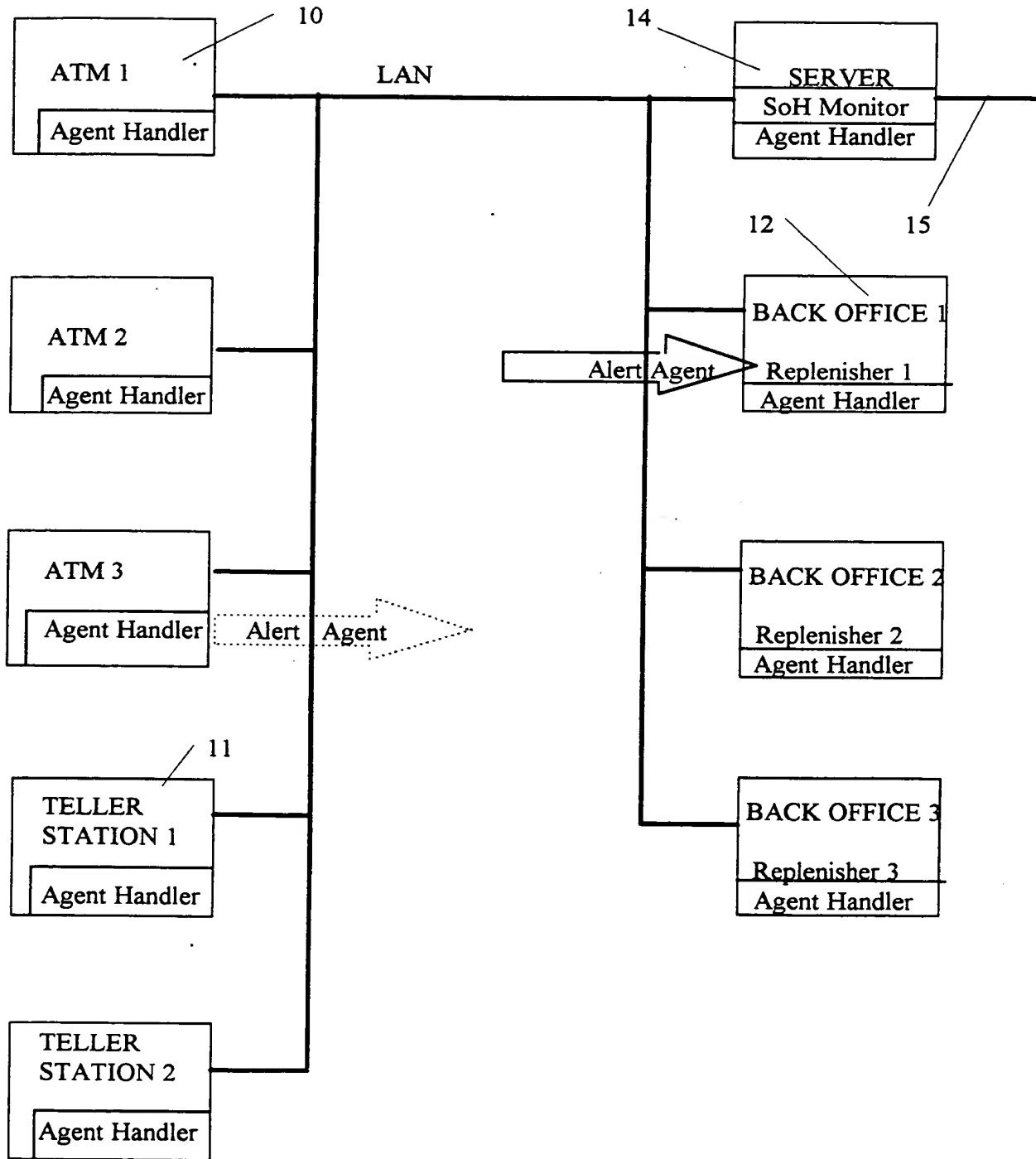
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FIGURE 5c



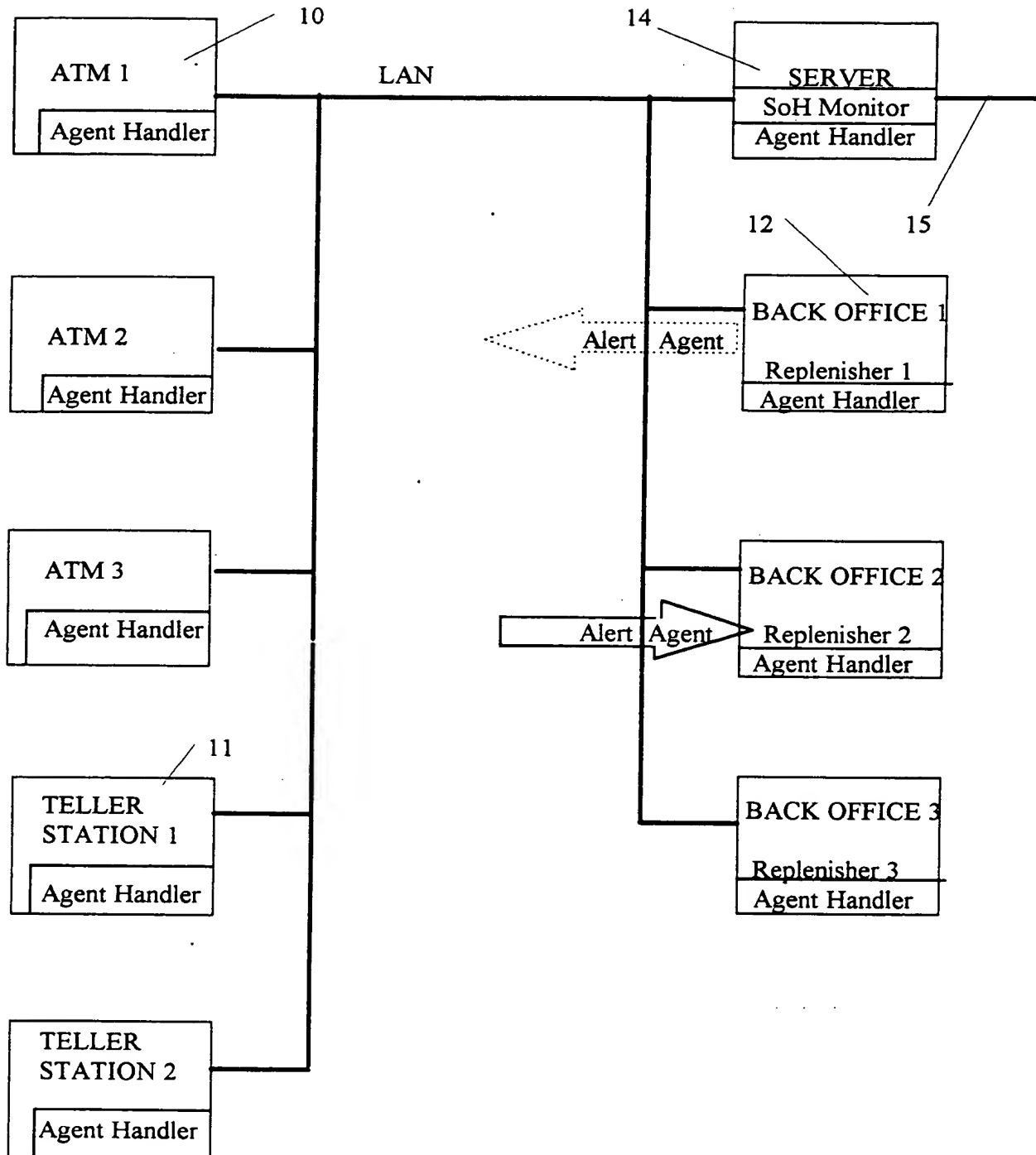
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FIGURE 6a



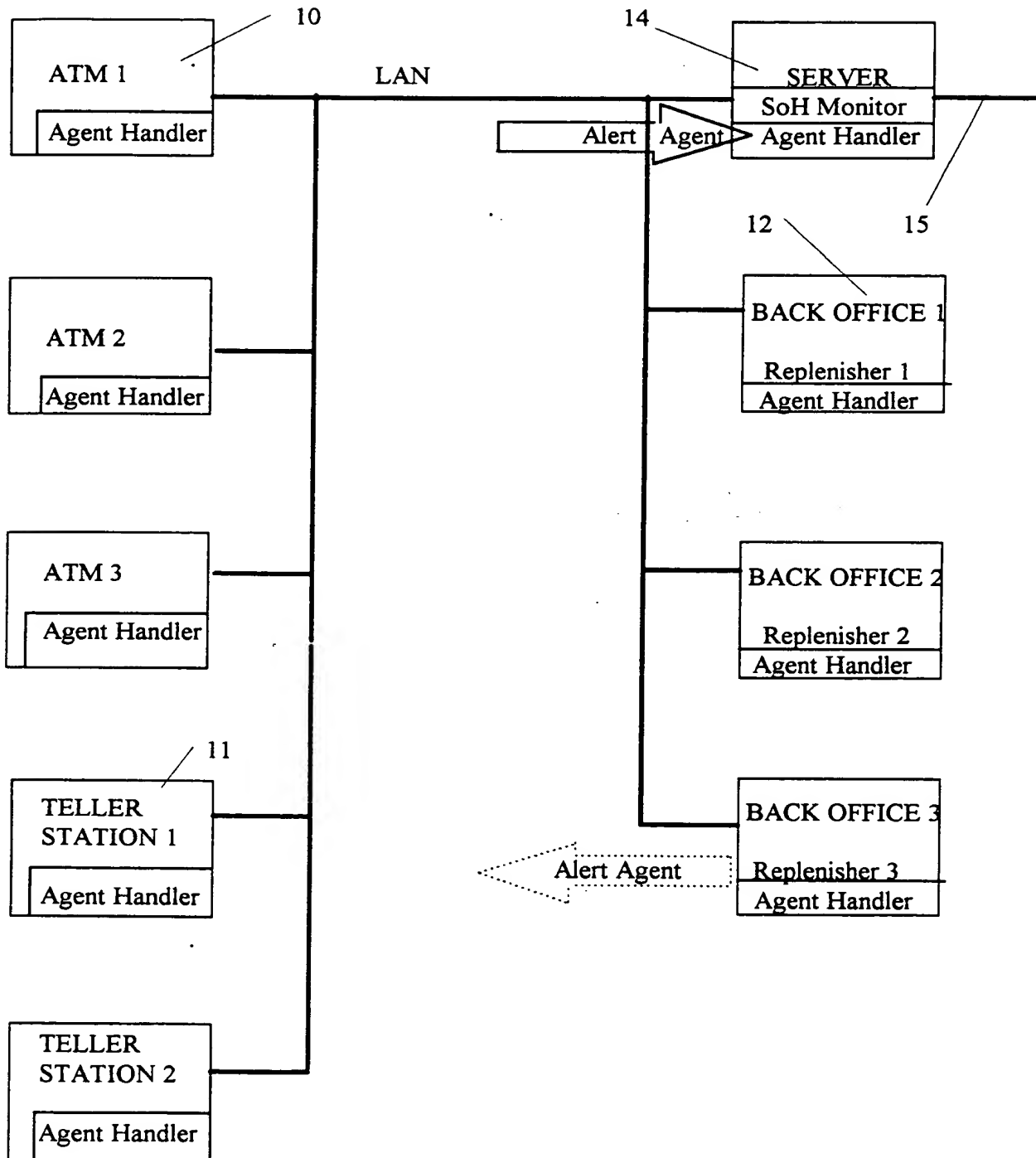
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FIGURE 6b



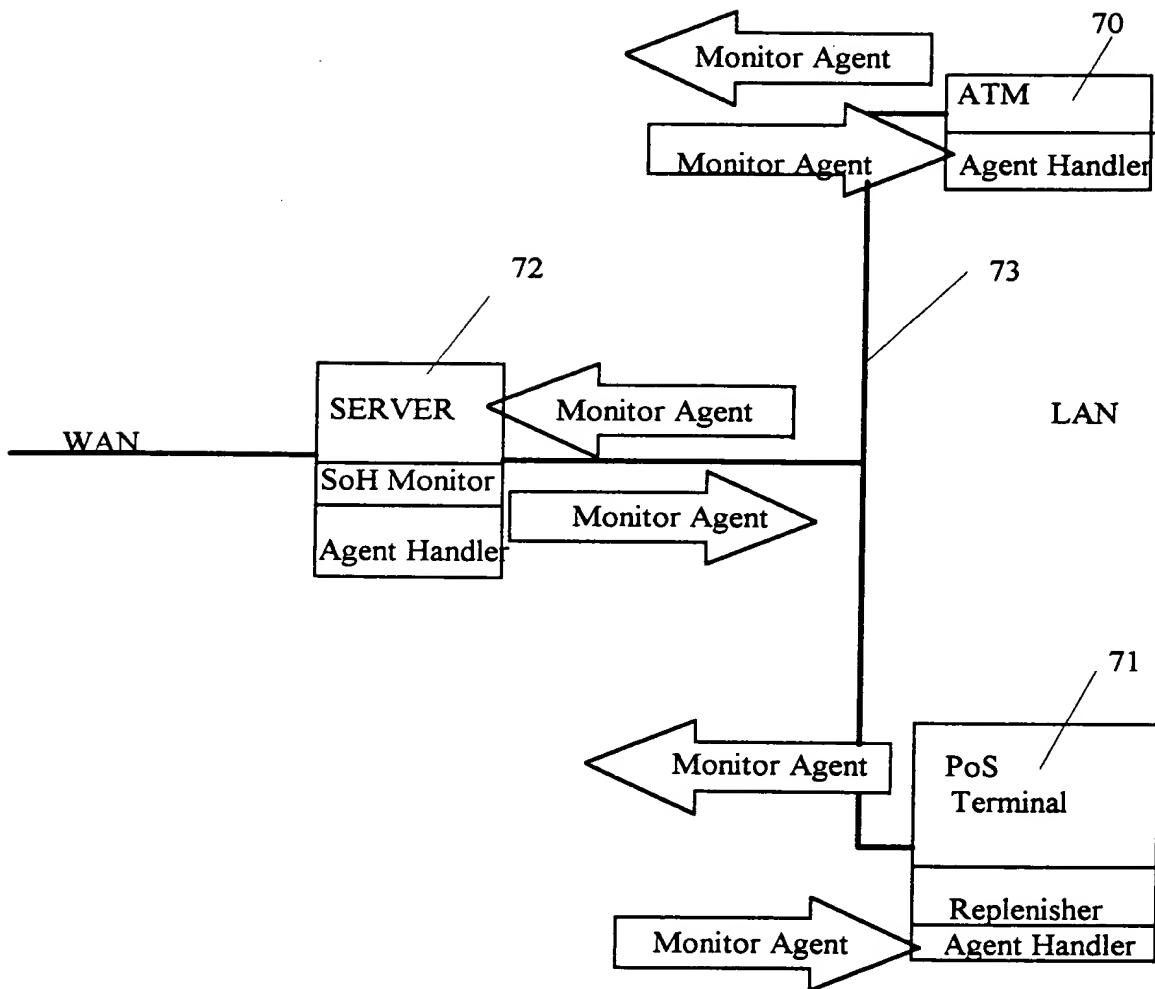
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FIGURE 6c



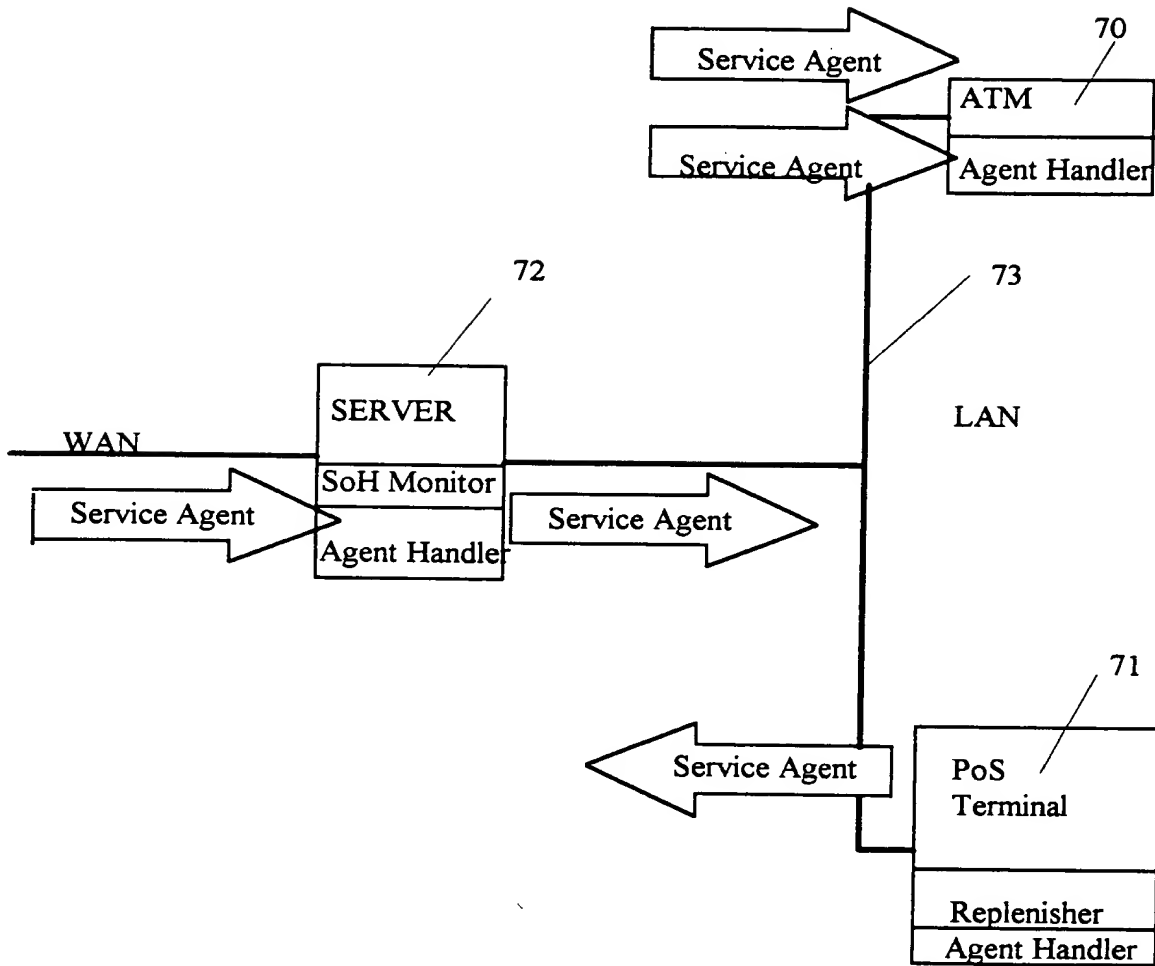
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FIGURE 7a



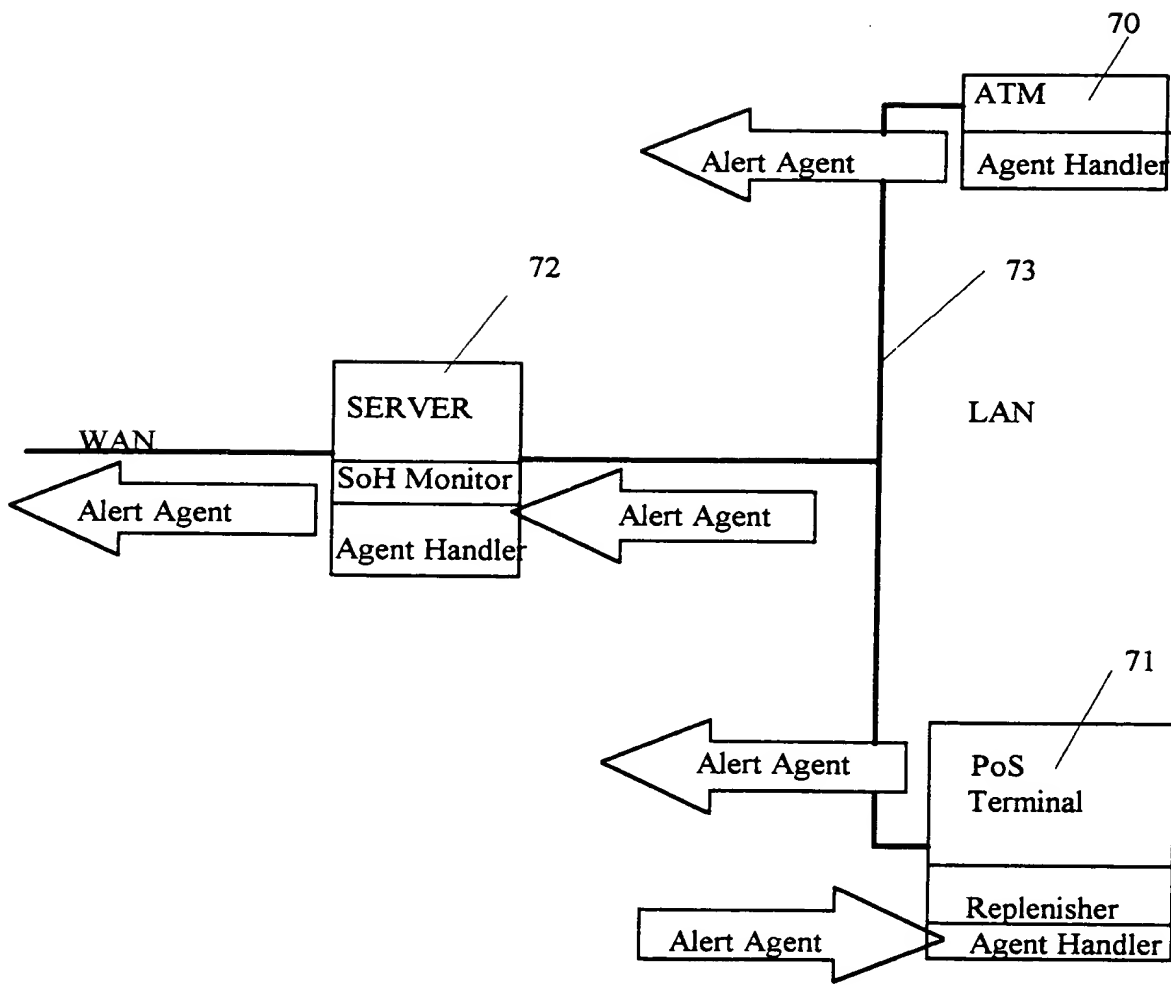
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FIGURE 7b



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FIGURE 7c



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